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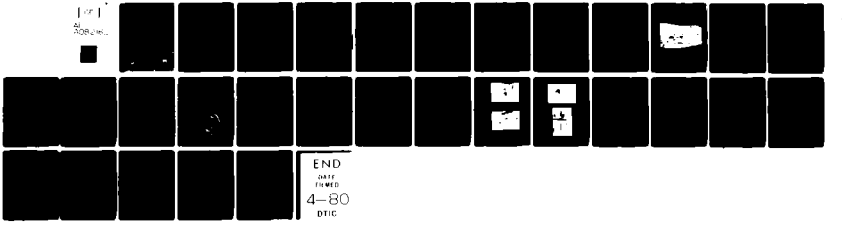

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This report describes a post-occupancy evaluation of a small mining community in the high Arctic. Providing superior housing, having wives work and integrating singles, Inuits (the indigenous people) and families successfully established a viable community. Fewer problems were encountered than is usual in other isolated cold regions communities. The central focal point of the town, a large dome, was diluted by later construction of buildings housing separate recreational and social facilities. Since the buildings are too costly to remove, the only method of restoring the focal point is to build connecting

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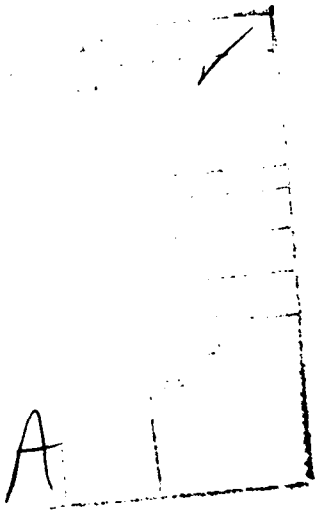
links at upper levels of the recreational buildings. This would only restore the focal point to a fraction of its original effectiveness. Nanisivik is an important lesson for designing future cold regions communities. It provides a successful example of housing, organization of living groups, and integration of working and living environments, and a classic example of a missed focal point design.

PREFACE

This report was prepared by Dr. Robert B. Bechtel, psychologist, Environmental Research and Development Foundation, Tucson, Arizona, and C. Burgess Ledbetter, formerly Research Architect, Applied Research Branch, Experimental Engineering Division, U.S. Army Cold Regions Research and Engineering Laboratory. Dr. Bechtel's work was performed under DACA 89-78-M-2086.

The report describes the post-occupancy evaluation of a remote mining community in the high Arctic. It is one of a number of detailed architectural-psychology investigations conducted by CRREL into the habitability of buildings and communities whose inhabitants spend most of their time indoors and have limited contact with the outside world for prolonged periods of time. Adverse weather further aggravates the living conditions. Lessons learned from these studies have yielded design and community planning guidelines used by the military, civilian governments, and private businesses to produce more cost effective habitation in remote regions.

Technical review of this report was performed by Nancy Dumont and Stephen Flanders of CRREL.



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POST OCCUPANCY EVALUATION OF A PLANNED COMMUNITY IN ARCTIC CANADA

INTRODUCTION

Nanisivik is a mining community in Canada's Northwest Territories, located on Strathcona Sound at the tip of Baffin Island, 720 km north of the Arctic Circle. The community was established by a combination of Canadian mining interests and European metal corporations with the Canadian government as an interested third partner. Zinc and lead ores are mined, concentrated, and stored during the winter and shipped out during the eight weeks of navigable weather in the summer. Including families, about 350 people live on the site.

As part of the U.S. Army Cold Regions Research and Engineering Laboratory's habitability project, which began in 1971, Nanisivik was chosen for a post-occupancy evaluation (POE). A post-occupancy evaluation studies the architectural and community design of a human settlement in terms of the settlement's habitability. Previous research (Bechtel and Ledbetter 1976) had shown that communities with behavioral focal points were more successful. Nanisivik had a central dome building which served as a probable focal point for its community.

The post-occupancy evaluation was made during the period 5-14 January 1979. Two researchers conducted an on-site behavior setting survey of the housing and public building of Nanisivik.

METHODS

The behavior setting survey measures the total behavior of a community (Barker 1968). The original technique required a full year; however, Bechtel (1977) developed an abbreviated form which takes only a week to ten days. Housing data are collected in a structured interview in which the interviewee lists the activities that took place inside and outside the home during the past year (in this case, calendar year 1978). A base line of 8,760 hours for the year is used for each person who lives in the house. Sleeping time (usually 8 hours per night), vacations, trips, shopping, work, movies, school, and other activities outside the house are subtracted from the base line to give hours in the house. These hours are then divided into activities and each activity is tested to see if the house design encourages or inhibits the human behavior.

Public behavior settings are activities open to the entire community, such as school classes, government offices, meetings, and sports. These settings are measured by questioning the leaders of the setting about time and duration of activity, number of people attending, and the behavior taking place. For each behavior setting the design of the room or space where it takes place is tested for appropriateness by observing the behavior in context and by asking people using the setting how well the environment is adapted to their activity. Interviews and observations provide converging data on design effectiveness. A list of

settings is compiled as a measure and description of total community activity. The form for recording setting data appears in Appendix B.

In addition to the behavior setting survey, respondents describe aspects of the buildings they like or dislike, have trouble with, or enjoy. Photographs of settings are taken to illustrate points uncovered in the data collection. The researchers also look for external signs of wear, broken or repaired fixtures, worn pathways, and other signs of human use of an environment. These data, taken together, are used in a design evaluation based directly on the observations of the users of the environment. The environment is also compared to other environments previously studied by the same technique.

RESULTS

Population

At the time of the behavior setting survey (made in 1978) there were 320 adults employed by the mining company (Nanisivik Mines, Ltd.), 36 adults employed by various government and civil agencies and 99 children. Of the adults, 214 were male and 141 were female. About 23.4% were Inuit. Total population for the year was estimated at 455, not counting visitors.

These figures fluctuated frequently. There were 213 permanent workers and 74 children in school on 30 December 1978. During the year turnover of workers was about 35% and 25 (7.8%) new people were added to the work force. In addition, about 70 different construction workers came on site and about 150 soldiers and other visitors passed through the community. Nanisivik has a constantly changing social environment.

Research findings

Behavior settings and genotypes. A list of genotypes is contained in Appendix A. Genotypes are groups of settings where leaders can be interchanged without affecting the normal course of events. School classes in the same subject are a good example. A total of 126 genotypes and 919 settings were recorded at Nanisivik. For a population of 450, this number is about par for Barker's (1968) small town of Midwest (750 people, 198 genotypes, 884 settings). In fact, Nanisivik, with its population of 450, has slightly more genotypes per person than does the Midwest town (0.28 vs 0.26), and certainly more behavior settings per person (2.04 vs 1.18). For a small community, it has a high ratio of behavior resources (via settings) available to its residents. This means the people of Nanisivik have many things they can do. Actually, the number of both settings and genotypes available to Nanisivik residents is much greater than normal for such a small community since the work settings at the mine and mill were not included in the survey.

Schematic plan. Nanisivik has concentrated its living and central community area in a small space with the work area somewhat distant (see Fig. 1).

The arrangement in Figure 1 contrasts with the ideal schematic of a large military installation presented in Bechtel and Ledbetter (1976) (Fig. 2).

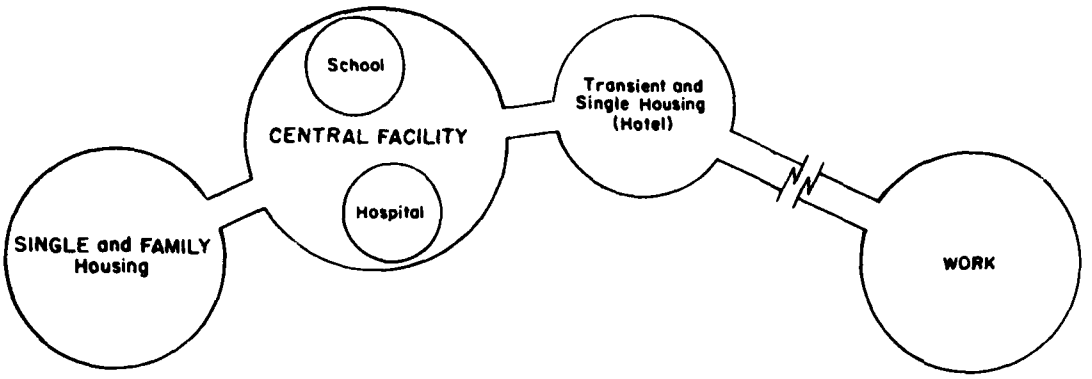
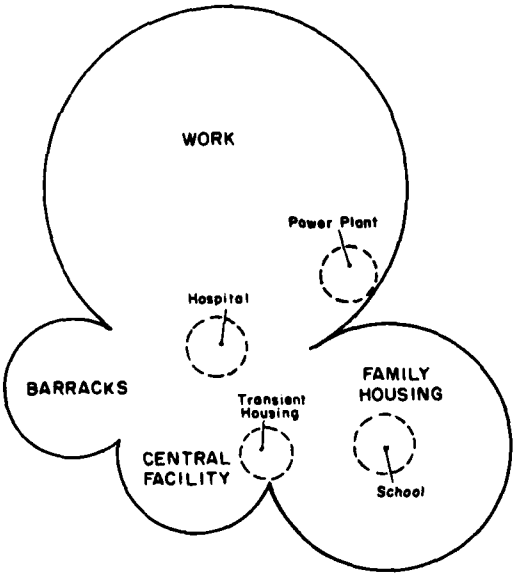


Figure 1. Schematic diagram of Nanisivik.



CENTRAL FACILITY

- PX
- Commissary
- Theater
- Bowling
- Clubs
- Day-care
- Hobby Shops
- Bowling
- Post Office

Figure 2. Schematic diagram of large installation site plan (Bechtel and Ledbetter, 1976).

The advantage of the Nanisivik scheme is that it provides a clearer separation of work areas from living areas and that it successfully mixes single and family personnel. Although the school is not in the midst of the housing, as recommended for the larger site (Bechtel and Ledbetter 1976), it is close enough that walking to it is convenient. Also, since the policy at Nanisivik is to have nearly all wives work, there is less reason to locate the school inside the housing perimeter.

Transient housing in Nanisivik does not serve the same function as it does at the large military base where families move into transient quarters prior to and after leaving family houses. At Nanisivik transient housing primarily serves single men. The largest group of transients, construction workers, had already left the site at survey time. In effect, transient visitors were housed in the midst of family housing in guest houses, vacant apartments, and vacant family houses. Thus, there is a true mix of all housing types except for the single quarters at the "hotel" in the center of Figure 1.

Figure 3 shows the central facilities and living areas of Nanisivik, with the dome a prominent feature.

Action patterns

Action patterns are large divisions of daily behavior used by Barker (1968) to classify activities. Each action pattern is defined below.

Aesthetics. Activities in settings which improve the appearance or clean up the environment are scored as aesthetics. Table 1 shows 61% of the 140 settings had this activity present, while 5% of the settings had this activity as prominent (more than 50% of the occupancy time). Behavior settings like the Arctic Bay Cleaners, the spring cleanup, and other activites that involved cleaning have aesthetics as a predominant part of their behavior.

Business. The buying and selling of articles of merchandise was present in only 16% of the settings and prominent in only two (1%), the co-op store and the Hudson's Bay store.

Professionalism. When leaders in a setting are paid for their services, the setting is scored for professionalism. A high number of the settings (63%) show this as a prominent activity, while 81% had it present.

Education. When formal teaching and learning take place, the setting is scored for education. Education was present in 36% of the settings and prominent in 15%.

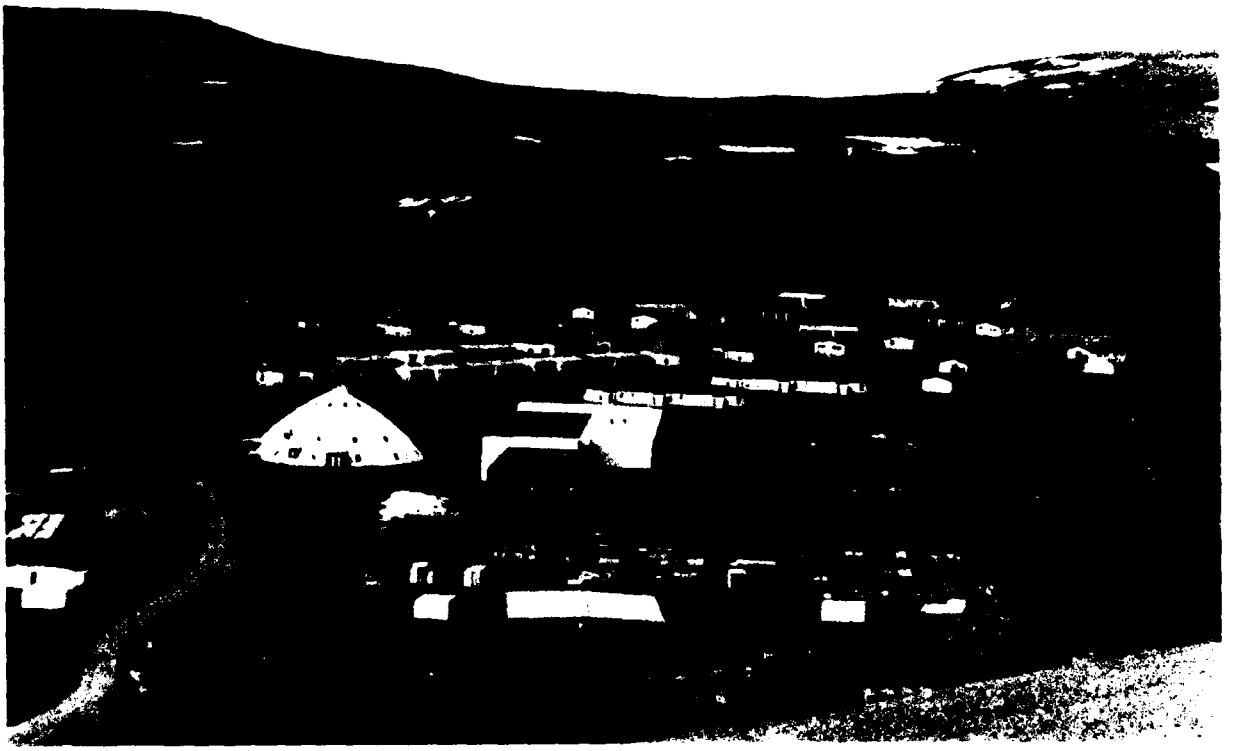


Figure 3. Nanisivik, showing the central location of the dome.

Government. Settings in which laws are enforced or obeyed are scored for government; 51% of the settings had government present as part of the behavior, while 21% had government a prominent part of the behavior. This is an unusually high rating for a community.

Nutrition. The making or eating of food gives a behavior setting a score on nutrition; 56% of the settings show eating behavior present, while 16% have it as a prominent part of the setting.

Personal appearance. When participants dress up especially or groom themselves, a setting is scored for personal appearance; 61% of the settings show personal appearance as present but none show it as prominent. The survey missed behavior settings like the barber shop and the beauty shop where personal appearance would be prominent.

Physical health. Settings which have behavior that promotes or elevates physical health are scored for this action pattern. Since many of the exercise classes, swimming, and games are participated in to improve physical health, such settings were scored accordingly. As a result, Nanisivik has a relatively high number of settings with physical health present (51%) and an unusually high number with physical health prominent (26%).

Recreation. Behavior that gives immediate gratification is scored as recreational; 68% of the settings measured had this action pattern present and 48% had it as prominent. This is also an unusually high percentage for a community. The Midwest study (Barker 1968) had recreation present in about 70% and prominent in only 30%. The high percentage of prominent recreational settings is probably accounted for by the presence of a recreation director, a recreation program, and an unusual array of recreational facilities.

Religion. Behavior that has to do with worship is scored as religion action pattern; 4% of all behavior settings had religion present and 3% scored as prominent.

Social contact. Interpersonal relations of any kind are scored as social contact; 97% of all behavior settings had social contact present while 71% had it prominent. The 3% of the settings without social contact were one-man settings such as swimming pool testing, audio-visual closet, etc.

Figure 4 summarizes the action patterns for Nanisivik, showing present and prominent percentages.

Behavior Mechanisms

Behavior mechanisms are a measure of the type of activities engaged in and the type of body functions used.

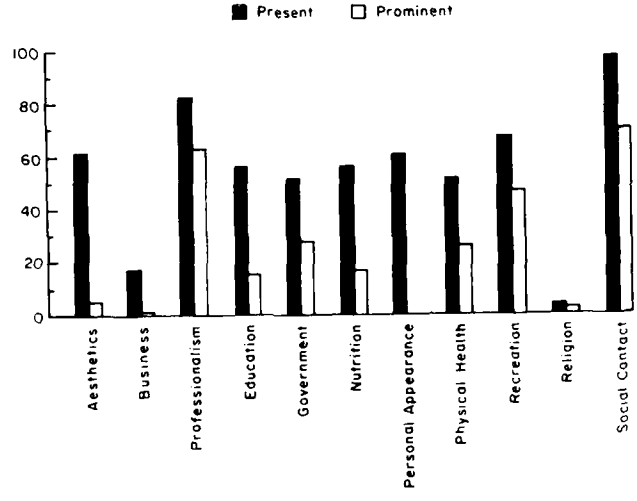


Figure 4. Action Patterns for Nanisivik.

Affective behavior is scored if there is overt emotional behavior of any kind, such as laughing, cheering, or yelling; 73% of the behavior settings were scored with affective behavior present, while only 14% had it as prominent.

Gross motor behavior is scored when large muscle activity is involved, such as walking, running, and swimming; 98% of the behavior settings were scored with gross motor behavior present, while 24% were scored with gross motor behavior prominent. Lack of automobiles and the closeness of public buildings to housing make walking a prominent part of Nanisivik life.

Manipulation is scored any time there is use of the hands in a behavior setting; 97% of the settings were scored with manipulation present, and 24% with it prominent.

Talking. Any social contact where oral communication takes place is scored as talking; 97% of the settings had talking present and 49% had it as a prominent part of their behavior. Only one-man settings had no talking.

Thinking. Wherever decisions are made, a thinking action pattern is scored; 64% of the settings have thinking present as part of their behavior patterns, but only 1% have thinking as a prominent activity.

Figure 5 lists the behavior mechanisms of Nanisivik, showing the present and prominent percentages.

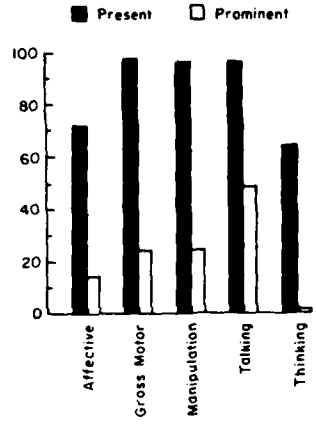


Figure 5. Behavior Mechanisms of Nanisivik.

Autonomy

The autonomy scale measures the level at which decisions are made in four areas: the appointment of leaders, the admittance of members of the community, the determination of fees and prices, and the establishment of programs and schedules. Autonomy is really a measure of the extent to which the people in a community control their daily lives.

The highest rating is a 9. This indicates that all four kinds of decisions are made entirely within the boundaries of the community. Conversely, a 1 would mean all decisions were made at the national level in Ottawa, and none were made within the community. All settings are rated on a 1 - 9 numerical scale.

A place like Nanisivik is difficult to rate on autonomy because theoretically everyone is there because of a decision at the national level. Yet, once there, the freedom to participate in most public settings outside of work is nearly complete.

These data indicate a fairly high proportion (56%) of the public settings had an autonomy rating of 9. This means slightly over half the decisions of the public settings are made within the community boundaries. This compares to about two-thirds for Barker's (1968) small community, indicating that there is less autonomy in Nanisivik than in the American small town community. This "loss" of local autonomy is almost entirely because Nanisivik is an isolated company town and because movement in and out of the community is fairly well restricted to company business except for the few local Inuit. The company does not "enforce" such movement, there is just nowhere to go outside the community.

Comparisons of autonomy are difficult because behavior setting surveys have not been done on other company towns. If one assumes that higher autonomy levels inherently benefit a community, then these data compare favorably to a U.S. military base where 63% of the decisions were at the 4 - 6 level, or even to the U.S. Federal Aviation Agency where only 38% of the decisions were at the 9 level.

Welfare and pressure ratings

Welfare and pressure scores relate to the hospitality of settings toward children and adolescents*. Pressure is measured on a scale of 1 - 7, from 1, where children or adolescents are required to enter the setting (such as schools), up to 7, where they are prohibited. Graduations of 2 to 6 are defined as urged, invited, neutral, tolerated, and resisted.

The average setting for Nanisivik has a mean of 3.9 for children, just below the neutral level of 4. However, 65% of the settings are open to children, which is better than Barker's (1968) small town which had only 54.4% of the settings open to children. Apparently, Nanisivik is a place that encourages children's participation.

Adolescents have unrestricted entry to 87% of Nanisivik's settings which also compares favorably with Midwest (only 69.1%).

*Persons under the age of 12 are children, those aged 12 to 17 and eleven months are adolescents.

Welfare ratings show which settings function primarily for the sake of the children and adolescents. A rating of 1 indicates the setting functions primarily for the welfare of children or adolescents. 16% of Nanisivik's settings exist primarily for the welfare of children and since about 32% of the population consists of school children, which are both children and adolescents, this means that only about half as many settings are provided as would be expected from a comparison with Barker's small town (23% settings vs 19% population). However, the number of adult settings open to children may more than compensate for the lack of settings purely for children.

General richness index

The general richness index, or GRI, is considered to be a general measure of behavioral resources. A setting with a large GRI is one in which many different groups (such as males, females, children, different races) engage in a wide variety of behavior as measured by action patterns and behavior mechanisms. It is characterized by the popular phrase "a lot of things going on."

The GRI is calculated by adding the action pattern ratings (AcR) to the behavior mechanism ratings (BmR) and the leadership level ratings called penetration levels (PenR) multiplied by the occupancy time ($_cOT$). Penetration levels are measures of leadership roles in each setting. Single leaders, which are rare, rated 6, shared leaders rated 5, functionaries such as secretaries, treasurers, etc. rate 4. Non-leadership ratings are members (3), visitors (2), and onlookers (1). Thus,

$$GRI = \frac{(\Sigma\ PenR + \Sigma\ AcR + \Sigma\ BmR)\ {}_cOT}{100}$$

Richer settings are seen as more attractive and satisfying to people. One can speak of richness in a particular setting or in a whole environment.

The average GRI for Nanisivik was 13.27, which compares favorably with averages obtained at a large military base in Alaska (12.06), a black public housing project in Ohio (8.54), and a poor white residential block in Kansas City, Missouri (7.88).

Behavioral focal point

A behavioral focal point serves as the setting in a community where the most different types of behavior occur. It is the place where anyone in the community can go to find out what is happening. It is the location most accessible to all population groups and it provides the place where the maximum amount of social contact with everyone in the community can occur.

A good behavioral focal point is one that does not require a social commitment. Any person can go there just to look in and see what is going on. There is no necessity to go there to buy something, or eat,

or engage in any particular activity. Even though many specific activities may be available in the focal point, anyone who goes there for a specific activity also anticipates encountering many other activities. The behavioral focal point serves as the place where members of the community get acquainted through regular and frequent contact.

The chief reason for selecting Nanisivik as a place for study was its use of a dome housing what appeared to be a behavioral focal point. Apparently, from comments made by residents of Nanisivik, *the dome* functioned much better as a focal point in earlier days, but has been somewhat diluted by the construction of the recreation center and other buildings. Residents made remarks such as, "there isn't the same feeling as when we were all together in the dome."

Nevertheless, the dome still serves as the behavioral focal point of the community and has the highest GRI of any behavior setting (65). This compares with a GRI of only 57 for the behavioral focal point of Barker's (1968) small town. The diagram of the community of Nanisivik with its behavior settings arranged is shown in Figure 6. From Figure

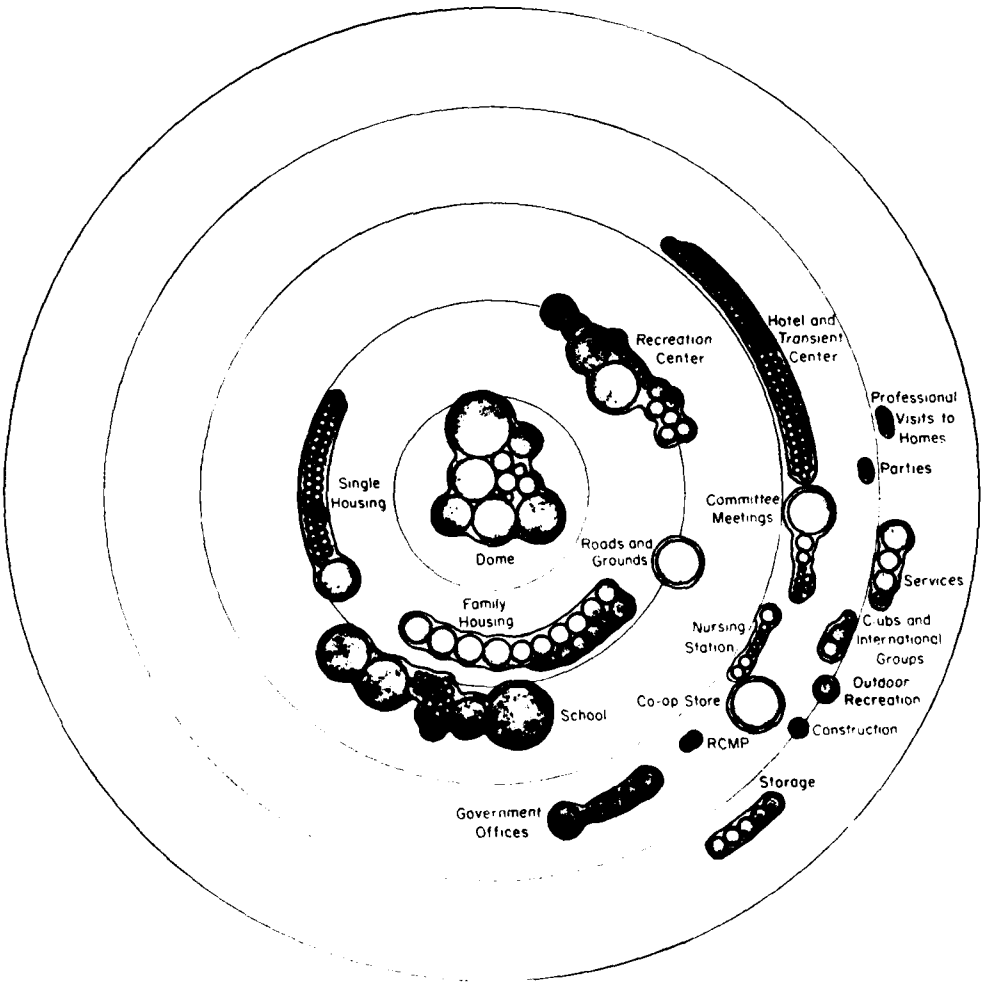


Figure 6. Behavior Setting Diagram at Nanisvik.

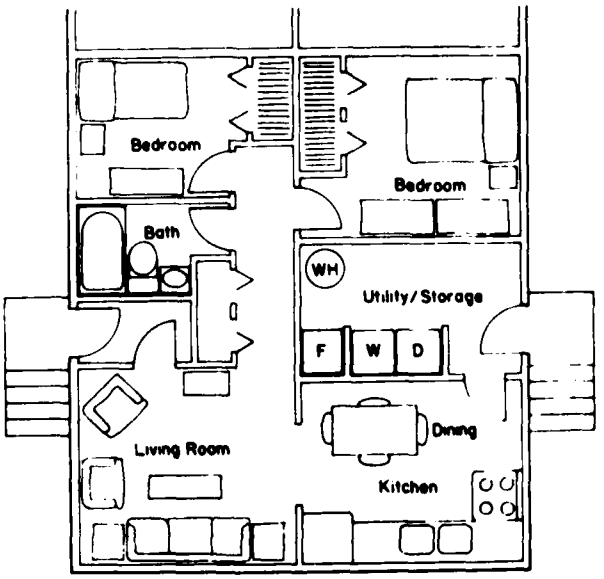
6 it is clear that although the dome is still the richest environment, the recreation building and other events serve as minor focal points separate from the dome building.

Housing types at Nanisivik

It was not possible to systematically study all the housing types at Nanisivik in the time available. Those types mentioned below reflect the views of residents who were available to be interviewed. A random sample was taken of all persons living in the housing section, whether part of a family or single. Of 65 families, 30 were sampled. Of 70 single accommodations, 16 were sampled. The fact that many employees were on vacation cut down the number actually interviewed to 14 families and 3 single men. Others were talked to on an informal basis but were not added to the sample; their remarks merely verified statements of the interviewees.

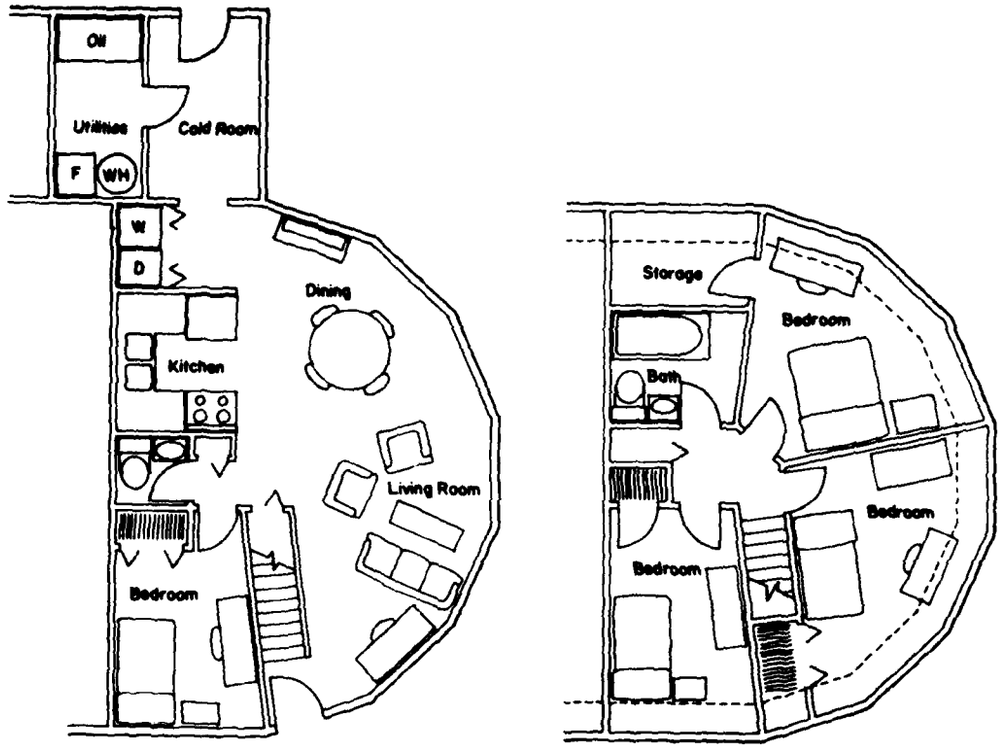
One outstanding circumstance of Nanisivik must be considered to influence any conclusions about housing. All residents interviewed or talked with were very favorably disposed toward their housing and nearly half mentioned that it was the best housing in which they had lived. Threfore, any comments related to housing must be taken in light of this favorable context.

Three types of houses are used at Nanisivik. Figure 7 shows the floor plans of the Desourdy, Domar, and Kafus houses.

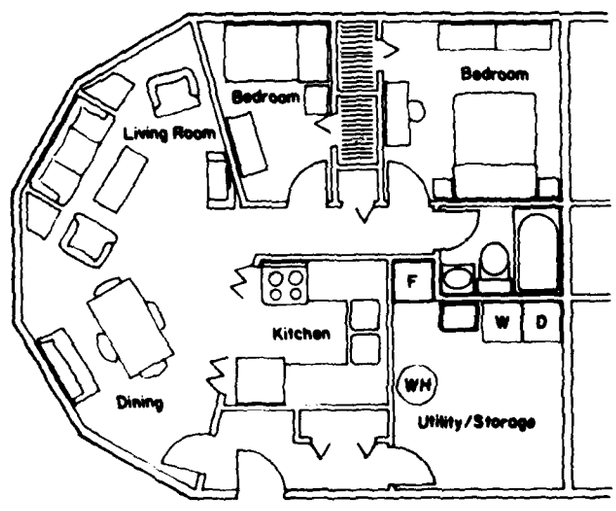


a. Desourdy.

Figure 7. Floor plans of Desourdy, Domar, and Kafus houses.



b. Domar.



c. Kafus.

Figure 7. (cont'd.)

Most of the comments on housing applied across all types. For example, every family felt it was necessary to have a freezer because of the necessity of storing large quantities of food ordered from far south. Yet no housing plan clearly provided for a space for a freezer. Some found room in the furnace and utility room, others would use a spare bedroom. Still others would crowd the freezer into the kitchen.

Lighting was considered inadequate in some way in all but two of the households interviewed. Sometimes there would merely be an insufficient number of lamps. In several cases lamps were moved from the bedrooms to the living areas. Some of the problem was because the lightbulbs were not considered adequately bright.

Several people mentioned wanting lights in their closets. Others mentioned that the kitchen lights were especially inadequate. A single globe in the kitchen ceiling cast shadows on any work at the sink or table. Similarly, many sink lights were placed so as to shadow work at the sink.

Some residents remedied the situation by adding their own lights, either to the kitchen or walls in other areas, or by installing new fixtures in places like bathrooms, hallways, and entrances.

Windows were a common complaint throughout most housing types. The thermal panes "leaked" air and frosted over. Sometimes this would produce icicles inside. This was remedied by either taping over the panes or simply letting them frost over entirely.

Furnaces, hot water heaters, and other utilities that stood open instead of being enclosed were a concern of families with children. While no respondent knew of an incident where children had been injured, the parents felt it was a present danger.

Some, but not a majority, felt the wood paneling was too dark and would have preferred a lighter interior. The remainder were neutral or satisfied.

Space was always a problem when the numbers of children were large. For some, even a four bedroom house seemed crowded. More closet space was especially needed for large families.

Humidity control was a problem mentioned in a majority of houses. Some never had a humidifier hooked up. Others felt the humidifier was adequate; some connected humidity with their children's health and brought in commercial humidifiers.

The common problem of doorway use in the Arctic was noted at Nanisivik. This problem occurs when there are two doorways but one is more accessible by car. The more accessible door gets used and the less accessible becomes almost permanently closed, regardless of whether an arctic entrance is attached to either.

Some specific housing types seemed to have common problems. For example, all the roofs of the Desourdy houses leaked. The dining room air intake of the Weber house was so high it drew out warm air. The Domar kitchens seemed too small to most. Sound traveled easily across Domar apartments.

Bathroom fans attached to the bathroom light switch were a small annoyance. This was remedied by disconnecting the fan. The high ceilings of the Domar and Kafus units were seen as causing large heat losses, yet many liked the spaciousness. Another problem was that windows in the domed part of the house could not be easily fitted with drapes. The drapes would fall away from the window. Some houses suffered from obvious construction defects, such as interior walls not meeting with the ceiling.

Figure 8 shows pictures of some of the interior problems mentioned, including a crowded utility room, poor overhead lighting in a kitchen, a poorly lighted living room, and a furnace chimney pipe in a closet that cuts down on storage space.

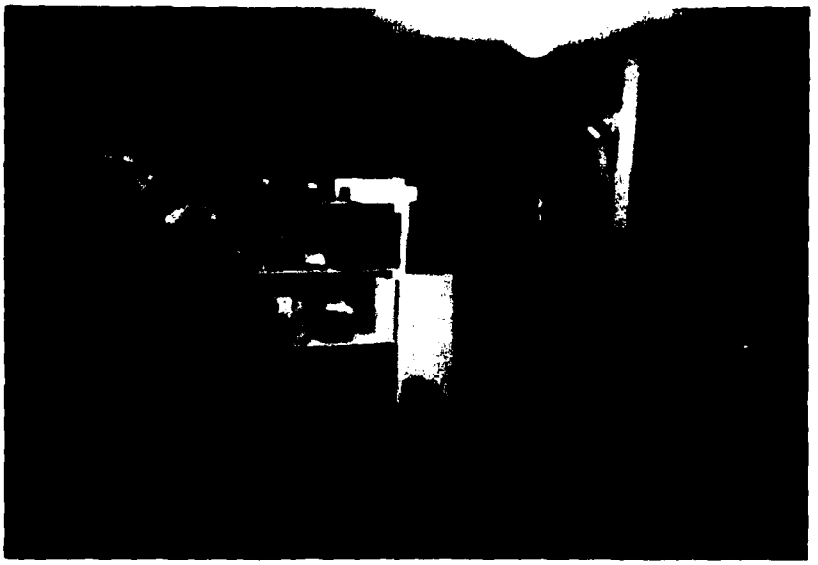
Inuit housing needs

Much has already been written about the inadequacy of housing design for the Inuit (Zrudlo 1977); however, the houses at Nanisivik are far better than any mentioned in the literature to date. Nevertheless, it is worth mentioning factors common to Inuit families for future design considerations.

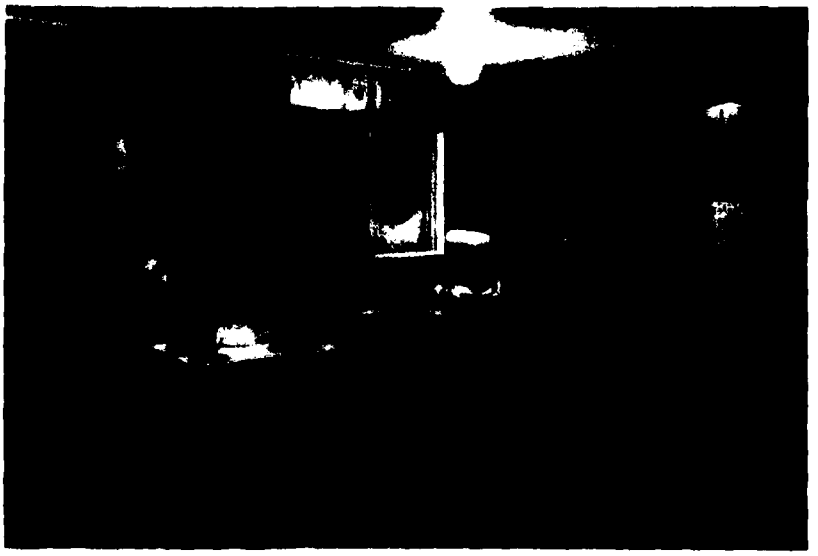
Inuit generally have larger families than the average Canadian or American. It is common for one family to have six to eight children. Houses with three or four bedrooms seem crowded, and the average dining area is too small to permit the whole family to eat together.

In addition to the large numbers of children, the Inuits have far more visitors than do the South Canadians and others living at Nanisivik. Some of this contrast is due to the large distance to major cities (5,000 km to Montreal), which makes visits to the South Canadian members of families living in Nanisivik difficult. The Inuit often have many relatives in nearby Arctic Bay, and visits are common. Some Inuit families had to turn away visitors because they did not have room. This is a social embarrassment in their culture. While it would be exorbitantly expensive to create bedroom space for these visits, it would be possible to help accommodate some by providing fold-out beds, trundles, etc. among the furniture for the Inuits. Some families are able to accommodate visitors with folding cots.

Utilities are another problem. Since many families come from much more primitive conditions, they would have appreciated appliance instructions written in Inuktitut. Verbal instructions to Inuit women on the use of appliances would have been even more helpful. Use of the stove, i.e. roasting, broiling, and barbecuing, still needs to be demonstrated. Most families interviewed did not understand the principle of the grease trap or charcoal air filter over the stove.

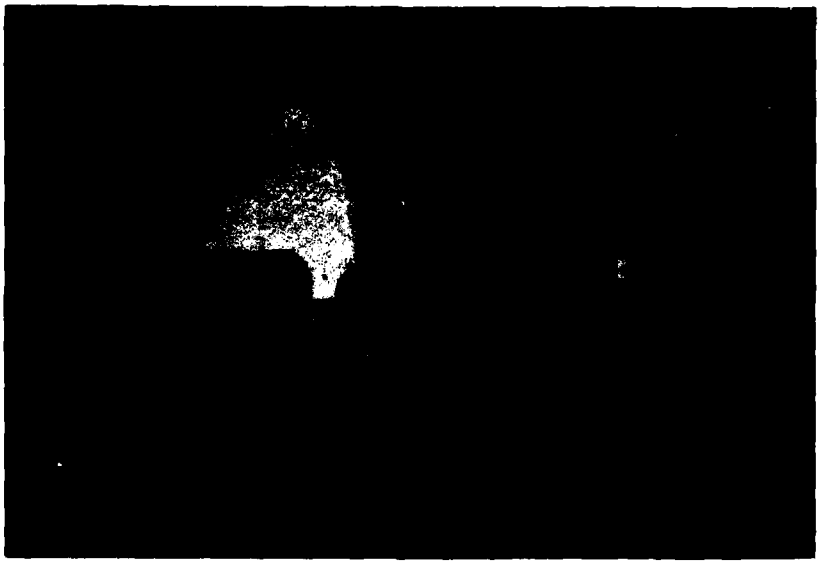


a) crowded utility room



b) poor lighting in kitchen

Figure 8. Interior problems.



c) poor lighting in living room

d) furnace chimney pipe in closet

Figure 8. (cont'd.)

A few Inuit mothers complained that the electrical outlets throughout the house were low enough that curious children could be injured by them.

Generally, the storage needs of Inuit seem to be at least equal to if not greater than those of Canadian families that have traveled a lot. The Inuit families with good jobs have acquired a large number of new objects and have no place to store them. They also complain of having no outside storage.

It must also be mentioned that the Inuit families, like the South Canadian families, felt the housing was among the best they had ever had.

Single housing

Of the few single men and one single woman interviewed, those housed in the larger homes, such as apartments or five-man single residences, seemed well satisfied. Those housed in the "hotel" complained of rooms being "closets" and overcrowded. A particular complaint was that the small rooms prevented them from keeping any possessions. One resident had taken shelves from other quarters for his books.

The residents of the hotel also felt more isolated from the rest of the community.

Life styles of families

Fifteen families were measured in the family sample. The GRI for families had an average of 18.07, which is five points higher than the 13.27 average for the public settings in Nanisivik. It is common to find that families have a richer environment than most public settings. Certain very rich public settings are exceptions; the dome, for example, has a GRI of 65.

Also, the GRI level for families at Nanisivik was lower than the GRI for the Alaskan military base (25.9). This is probably because fewer hours are spent in the home.

Husbands spent an average of 1,647 hours in the house, less than half the number of hours for husbands at military bases in Alaska (4,580 c.f. Bechtel 1977, p. 133). The average number of hours the wife spends in the house was even less in comparison, about one-third as much (2,169 vs 6,380). The reasons for this contrast are the longer hours per day spent at work, 9 or 9 1/2 hours vs 8 hours, and a six-day work week instead of a five day work week. Further, the policy at Nanisivik was to have as many wives work as possible, so that every wife interviewed had a job, as contrasted to the military base in Alaska where only one-third of the wives worked. In addition, vacation times away from Nanisivik would often be 6 to 8 weeks per year as contrasted to two to four weeks at the Alaska military base.

The results of these longer hours at work, however, show up in reducing the number of social activities such as visitors. The reported average number of hours for adult visitors was 221 hours, which is about one-third the number of hours reported for the Alaskan military base (696). It is obvious that with a greater number of working hours, less time is available for recreation. Some residents complained that when they got home from work they were "too tired to do anything."

Life styles of single men

Since only three single men were interviewed, any generalization to single men as a group must be made with caution. Nevertheless, the broad outlines of single men's life styles in remote locations have been shown to be fairly stable and not likely to vary as much as those of families (Bechtel and Ledbetter 1976).

The GRI for each single man's residence was a 6, indicating a richness level less than half that of families. This is typical for a single residence as compared to a family residence. Yet, the GRI for Nanisivik men is only half that of the Alaskan soldier (12.3). Part of this is due to the longer working hours for the Nanisivik population, but part is also due to a lack of behavior resources in the immediate environment.

The average single man (of the three) reported a total of only 1,016 hours spent in the room. This compares with 1,647 hours reported for family men. It would be expected that single men report more time away from their residence, largely because of "nothing to do" there.

Because of shift rotations, the single men do not experience a constant deprivation of night or "graveyard" shifts. But they report that the shifts other than day shift are the bleakest period of their stay, especially in winter. This is because nearly all recreational activities are geared toward the day shift. Yet when recreational activities were kept open especially for workers on the later shifts they were so poorly attended that they were dropped.

Excursive and incursive settings

Behavior settings can begin inside a community and reach out to other areas outside the community boundaries. These are called excursive settings. An example is the working women's trip to Arctic Bay. The women gathered at Nanisivik, drove to Arctic Bay, and returned. Similarly, settings can begin outside the community and end up within the community boundaries. An example of this is the Arctic Bay Cleaners, who begin in Arctic Bay, come to Nanisivik to clean buildings, and then return. These are called incursive settings. The percentage of incursive and excursive settings is a measure of isolation. Settings that are neither excursive nor incursive are called on-site settings. A comparison of Nanisivik's isolation scores with those of other communities appears in Table 1.

Table 1. Incursive and excursive setting percentages for various communities

	Excursive	On site	Incursive
Fort Wainwright, Alaska	2	96	2
FAA settlements, Alaska	7	79	14
Aircraft control and warning stations (AC&W), Alaska	3	86	11
Nanisivik	8	85	7

These data would seem to indicate that Nanisivik compares with the AC&W stations most closely. Considering the much greater geographical isolation of Nanisivik, this indicates that a fair amount of contact goes on. It should also be considered that many excursive and incursive settings were not included in the survey so the degree of isolation is undoubtedly much less.

Performance-population ratios

As part of the measurement of each behavior setting, the people in the setting are divided into performers and non-performers. Performers are rated by the penetration level scale already mentioned (page 14). Performers are really the leaders of a setting and they are assigned levels 4, 5 or 6. The remainder are considered non-performers.

To obtain the performance-population ratio, the total number of people who enter a setting are divided into the number of performers. This ratio is then averaged for all settings. For the 140 public settings of Nanisivik, the average performance-population ratio is 0.29. This compares with other arctic environments as follows:

Table 2. Performance-population ratios of arctic communities.

AC&W stations, Alaska	0.65
FAA stations, Alaska	0.45
Fort Wainwright, Alaska	0.31
Nanisivik, N.W.T.	0.29 (round to 0.30)

According to Table 2, Nanisivik seems comparable to Fort Wainwright, a large military base (population over 5,000). These data may mean that more leadership positions should be opened to Nanisivik residents in the public settings. It may also be a result of the large number of hours worked, resulting in too few hours available for leadership roles.

CONCLUSIONS AND DISCUSSION

The purpose of this research was to evaluate Nanisivik, a community designed around a behavioral focal point. Since community demands exceeded the capacity of the building housing the focal point, new buildings were constructed that diluted the focal point's original purpose. Yet the community retains the original building, the dome, as a functioning focal point and center of daily community life. In that sense, the original plan is still a qualified success.

Two policy decisions have influenced the quality of life at Nanisivik beyond the presence or absence of any focal point design. The first of these was to have the quality of housing be equal or superior to housing most residents had encountered in other communities. The result was that housing became a positive asset of community experience.

The second decision was to increase the amount of time spent working and to employ the wives of workers. The result of this decision was to drastically reduce the amount of time spent in the home and in recreational pursuits in the home. However, the data show that in public settings the recreational level is above the average for a small town in the American Midwest which is considered a high standard for community participation. The increase in time spent at work agrees with previous experiences in military bases in Alaska, where it was found that increasing work loads resulted in fewer domestic problems.

In addition, the data show the Nanisivik community to be especially receptive to children and adolescents in its public settings.

Some basic questions remain. It appears that Nanisivik functions relatively well without having the ideal focal point around which its activities are organized. But there is a problem in participation for the very expensive swimming pool. It appeared, at the time of the study, that adult participation had dropped off and that some effort would need to be made to raise participation, to justify the presence of such an expensive facility.

Some of this problem is related to management and scheduling. For example, allowing residents to keep towels and swimsuits in lockers at the pool would permit them to swim more on impulse instead of having to plan a trip home to collect swimming gear.

Another policy that markedly influences participation is the separation of adults and children. Adults do not like to share a swimming pool with children and if they see large numbers of children, they tend to leave. This can be alleviated by scheduling separate adults' and children's nights. Policies of these kinds can have a direct influence on participation level.

Architectural design, however, can complement or interfere with such policies. If the pool is within sight of a behavioral focal point, it

is more likely people will be attracted to it both to watch and to participate and be seen. When the pool is in a separate building, it requires a person to make a social commitment when he leaves a building to go to the pool. In addition, in winter this often involves suiting up for the cold. These elements work against participation.

An obvious, but perhaps prohibitively expensive solution is to enclose all the recreational facilities in a larger dome. Short of that, the dome could serve as a kind of central mall on which all the other buildings front. This would be a solution only for the design and construction of a new site. About the best that could be done for the present site would be to connect the recreational building and the dome at both the ground and second floor levels.

The housing shortcomings at Nanisivik seem to result more from the present state of housing construction in the Arctic than from faulty design. Windows that do not work and lights that are too dim are faults easily corrected. The settling that caused some ceilings to part from interior walls is merely the result of ignorance in construction practice. But these problems point out the difficulty in conveying knowledge about arctic construction to the proper sources.

The integration of Inuit in the housing and work environment of Nanisivik is another factor contributing to the quality of its life. Since the housing is of better quality, Inuit families view the experience as positive despite some cultural adjustment problems.

Overall, the town of Nanisivik is undoubtedly one of the better examples of the state of the art for designing arctic communities. It seems to have avoided many of the past mistakes and made a real effort to build an integrated community. It is a place that measures as a good environment for families, children, and workers and it integrates the Inuit in housing and work situations.

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APPENDIX A: GENOTYPES OF NANISIVIK, N.W.T., FOR THE YEAR 1978.

A

1. Adult education classes (12)
2. Adult swimming lesson
3. Afternoon day care movies
4. Airport cleaning
5. Airport storage
6. Anglican services (69)
7. Arctic Bay Cleaners

B

8. Badminton games (50)
9. Baseball games (24)
10. Basketball games (30)
11. Birthday parties
12. Bridge clubs
13. Broomball committee (12)
14. Broomball referees' committee (8)
15. Bus

C

16. Camp services office
17. Catholic services (2)
18. Child care (after school)
19. Child supervisor officer
20. Child swimming
21. Children's Saturday matinee (50)
22. Church construction
23. Cleaning of single quarters
24. Cocktail parties
25. Community Club Board of Directors' meetings (36)
26. Community Club Christmas party
27. Community Club offices
28. Community Club officers' swimming class
29. Company medical examinations

D

30. Daily clinic
31. December 23rd supper party
32. Dentist visits
33. Department of Public Works office
34. Director of Education visit

E

35. Economic Development office
36. Employment office
37. Environment Officer visits (2)

F

38. Family housing (65)
39. Fitness class
40. Floor hockey games (25)
41. Food storage at warehouse
42. French television room
43. Friday movies (50)
44. Furnace rooms (3)

G

45. General adult swimming
46. Guest houses (2)

H

47. Highway Department garage
48. Hike for day care
49. Home economics room
50. Horse tournament games (8)
51. Hotel coffee urn
52. Hotel hallways

53. Hotel latrines (2)
54. Hotel TV room
55. Hotel vestibule

I

56. Infant Nursery

J

57. Janitor's storage rooms (2)

K

58. Kindergarten

L

59. Laundry rooms (2)
60. LEA Education Committee meetings (2)
61. Library
62. Linen storage room
63. Local government meetings (2)
64. Lunchtime child care

M

65. MD visits (4)
66. Meals in dome
67. Men's sauna and lockers
68. Movie Committee meeting (6)
69. Mums and tots swimming
70. Music and science room

N

71. Nanisivik Community Club storage
72. Nanisivik Sewing Circle
73. Night baker
74. NWT Commissioner's visits (2)
75. Nurses' day care visits (2)
76. Nurses' home visits to Inuits (51)
77. Nurses' home visits to others (30)
78. Nurses' school visits (2)
79. Nurse-teacher conferences (2)

P

80. Pentacostal services (17)
81. Pentacostal Sunday School (12)
82. Peri-natal clinic
83. Planning meetings for community picnic (6)
84. Planning meetings for excursion (6)
85. Pool room
86. Pool maintenance
87. Pool testing
88. Postal Inspector's visits (3)
89. Post Office
90. Preschool day care
91. Primary activity room
92. Principal's office
93. Public health movies (4)
94. Psychometrist's visits (2)

Q

95. Quarters maintenance

R

96. Radio station
97. RCMP activities
98. Roads and grounds
99. Roasts (2)

S

100. Saturday morning movies (25)
101. School Area Supervisor visits (2)
102. School Christmas party
103. School classes (3)
104. School hallways
105. School movie
106. School Superintendent visits (3)
107. Shop room
108. Single status housing - houses (37)
109. Single status housing - transient trailers (15)
110. Single status housing - hotel (35)
111. Spring cleanup
112. Staff meetings
113. Stores (2)

T

114. TB follow-up clinic
115. Teacher Consultant visit
116. Teachers' lounge
117. Trials (2)

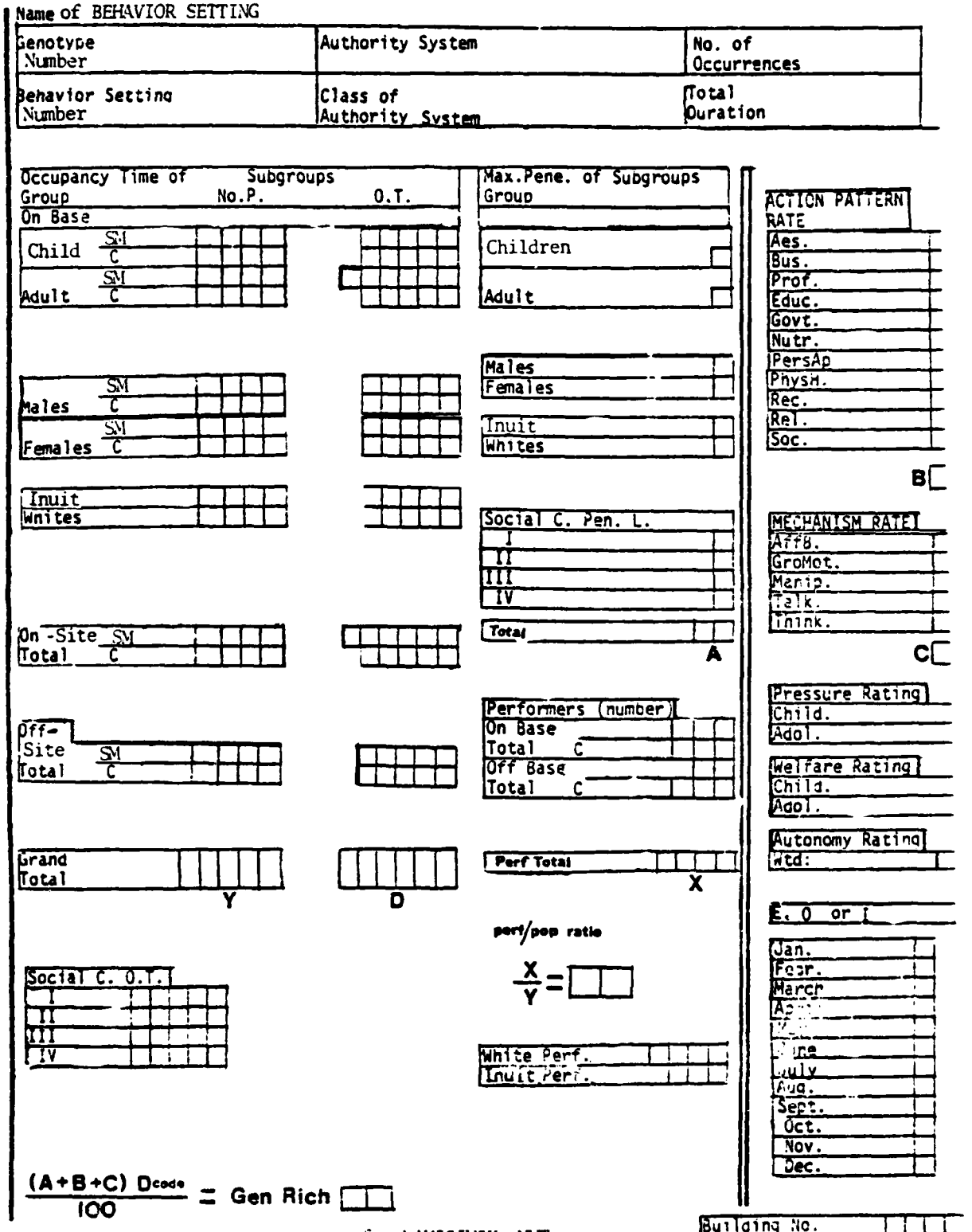
V

118. Vacation time day care
119. Visual - audio store room
120. Volleyball games (12)
121. Volleyball tournament games (2)

W

122. Weight lifting
123. Well baby and well child clinic
124. Women's Arctic Bay trip
125. Women's sauna and lockers
126. Women's swim night

APPENDIX B



1979 habitability behavior setting data sheet for NANISIVIK, NWT

*U.S. GOVERNMENT PRINTING OFFICE: 1980 — 602-982/391